upper New York Bay and the lower Hudson are underlaid by an accumulation of foul-smelling black ooze in which fragments of sewage origin are readily discoverable. These deposits are of considerable thickness, sewage matters having been brought up from a depth of ten feet below the surface of the mud."

The Bronx sewer to which objection is thus made is being constructed under permission of the State Legislature by a special act approved May 26th, 1905.

This action by the Sewerage Commission is prompted by conditions that will never, it is hoped, be paralelled in the Bay of San Francisco. They are hardly possible except, of course, in the case of the cities which are separated from the deep waters of the bay by a broad expanse of tidal lands and which are too prone to accept a delivery of sewage into some estuary or slough in which the tide ebbs and flows as an ultimate solution of their problems.

At New York the tidal flow is only about one-tenth or one-twelfth of the tidal flow of the Bay of San Francisco while the population that is contributing to the pollution of the New York waters is five to six times as great as that around the Bay of San Francisco. So that even though a rapid growth of population is to be assumed for the Bay Cities and particularly for the East side Bay Cities, objectionable fouling of the bay waters as a whole, if sewage be properly disseminated, must be in the remote future.

But the question is not so easily answered as to what is involved in securing a proper dissemination of sewage in the bay waters. It is manifest that where sewage is allowed to flow into the bay on mudflats between high and low water, that more or less offensive matter will lodge along shore or on the flats that are only periodically covered with water and that sooner or later steps must be taken to keep the waterfront free from such offensive accumulations. The time when some preparation of the sewage for delivery into the bay and when extension of the outfall structures into deep waters will be necessary will surely come for the cities Alameda, Oakland and Berkeley.

The question of sewage disposal with all that this involves both for cities that are favorably located on large bodies of tidal waters and for the municipalities whose problems will be of a more intricate nature is always a timely one and peculiarly appropriate to receive careful attention by the medical profession whose active support the sanitary engineer relies upon when such vital problems are presented for final decision.

OPPORTUNITIES OF THE STATE HYGIENIC LABORATORY.*

W. A. SAWYER, M. D., Berkeley.

In the vast area of California, containing every gradation of climate from the heat of the desert below sea level to the cold of perpetual snow on our mountain tops, a great multiplicity of problems arises to confront the State Hygienic Laboratory. The large rivers of the fertile valleys of the interior and the long stretch of sea-coast with its several harbors present questions which can only be solved by expert laboratory investigations. The commerce of our principal seaports brings to us a great variety of foreigners who introduce new disease problems from the Orient.

The essentially progressive people of California, eager to advance measures for public health improvement, and a large and alert medical profession make the outlook encouraging to those striving to subdue in the near future many of our most serious diseases. With abundance of good example from older communities, California has the opportunity of rapidly converting her growing Hygienic Laboratory into a larger institution capable of handling all the varied laboratory problems which face those who are striving to guard our lives and health.

The functions of a complete and efficient hygienic laboratory are analogous to those of the physician in the circle of families under his care. He makes diagnoses of diseases and applies the appropriate treatments. He also investigates the conditions threatening the health of his charges and gives instruction in the methods of avoiding danger. These four functions—diagnosis, treatment, investigation and instruction—include the various activities essential to a complete hygienic laboratory.

The first function, diagnosis, includes most of the present work of the State Hygienic Laboratory. During the five years of the laboratory's existence there has been a steady and rapid increase in the number of specimens of material submitted for the determination of the presence of evidence of disease essentially dangerous to the public health. The examination of material for diagnosis gives the physician and his patient the advantage of early laboratory investigation, and also brings into the hands of the State Board of Health and of the local health officer the report from the laboratory of the presence of disease having a serious public health bearing. At present, throat and nose cultures are being examined for diphtheria bacilli, sputum for the bacilli of tuberculosis, dried blood for the Widal reaction of typhoid fever, blood smears for the plasmodia of malaria, material or cultures for evidence of anthrax or glanders, smears of pus for the gonococcus, and feces for amebae or the ova of hookworm. Mailing outfits complying with the postal laws are sent out on request to physicians desiring to send specimens of the kinds just mentioned. The brains of dogs suspected of having rabies are searched for Negri bodies, and, if these are not found, animals are inoculated with some of the material in order definitely to establish a positive or negative. diagnosis. The report of the routine diagnostic work of the biennial period ending on June 30, 1910, showed that 3,955 specimens were examined. These figures show an increase of 76% over the number for the preceding two years. Although the rate of growth of the work shows an increasing appreciation of the value of the laboratory by the physicians of California, the total figures are far too small and indicate that many communities make little use of the laboratory and that many physicians still depend entirely on bedside observation in the

* Read before the Alameda County Medical Association, January 17, 1911.

diagnosis and management of cases of diphtheria. Consequently they work without any means of detecting those cases which do not present typical membranes and of discovering the carriers who keep epidemics alive after all the recognized cases have been quarantined. For this state of affairs the physicians of communities which are far from the laboratory cannot be given much blame. Unless the physician intending to take a culture has on hand a reasonably fresh tube of medium and a suitable mailing outfit, he must write or telegraph to the laboratory for these materials and wait until they arrive by mail or express. After the culture has been taken, another delay is necessitated in transmitting it through the mails. The total time consumed is apt to be sufficiently great to prevent the report of the laboratory from benefiting the patient and from being of any great value in determining the time of release from quarantine. As a result the physicians practicing in regions remote from the laboratory make little use of its privileges. The laboratory has now the opportunity of correcting this limited and unfair distribution of its services. The establishment and systematic replenishing of depositories for free mailing outfits in drug stores of all the larger towns of the state, would enable the great majority of the physicians of California to drive in a few minutes from their offices to a place where a fresh culture-tube could be obtained. A system of three branch laboratories maintained in Southern California, in the San Joaquin Valley, and in Northern California, would enable cultures to reach a state bacteriologist in a reasonably short time. Such a system would give every part of the state equal laboratory service and prompt and therefore valuable reports.

The present educational campaign against syphilis and gonorrhea has indicated the necessity for reliable statistics concerning their prevalence. One result has been the timely resolution of the State Board of Health making these diseases reportable. Another has been the laboratory's intention to examine smears for the gonococcus. From several sources suggestions have come that the laboratory should undertake the performance of the Wassermann test for syphilis for individuals who can be sent to the laboratory, and for some of our institutions in which the part played by syphilis in producing insanity and pauperism and the resulting expense to the taxpayer has not been worked out. The Director of the Laboratory will be glad to receive from any persons interested in the campaign against venereal disease, and especially from physicians, opinions concerning the advisability of the Wassermann test being performed by the State Hygienic Laboratory.

The second great function of a Hygienic Laboratory is treatment. In Massachusetts the State produced and distributed without cost to the recipients, in the year ending November 30, 1908, 94,645 packages of diphtheria antitoxin and 48,768 tubes of smallpox vaccine. At present the Massachusetts State Board of Health also distributes without charge in glass containers a solution of one per cent. silver nitrate to be used in the prevention of gonorrheal ophthalmia in the newborn. The manufacture of diphtheria antitoxin and vaccine by the State of California does not at present seem to be urgently indicated, especially as certain manufacturers have agreed to sell antitoxin for use in indigent cases at a very low cost.

Although the manufacture of vaccine virus for the prevention of smallpox is well cared for by private laboratories and the public is protected by Federal regulation against contamination of the vaccine by dangerous impurities, there is as yet no official safeguard against the sale of inert vaccine. It seems desirable that the State Hygienic Laboratory should request records of the percentage of "takes" from each fresh supply of vaccine used in public institutions. A report from the laboratory that a reasonable percentage of successful vaccinations from a given sample had not been obtained would result in the refusal by the producers to put on sale any of the vaccine produced in the same lot. A commercial laboratory would be more than repaid for the occasional loss of a quantity of inert vaccine by improvement in its reputation for reliability of the product sold. A systematic series of tests for potency would greatly diminish the large numbers of failures to "take," and consequently increase the protection of the community against smallpox. At the time of an epidemic a quantity of impotent vaccine could result in a failure to prevent the spread of smallpox to many new victims.

There is one variety of treatment which should be taken up by the State Hygienic Laboratory at the earliest possible time. That is the Pasteur treatment for the prevention of hydrophobia. The control of this disease is essentially a community problem and an infected individual is seldom to blame for his inoculation through the bite of a rabid animal. The disease has become so prevalent among dogs in some parts of the state that in a period of about a year 122 laboratory examinations of the brains of animals (mostly dogs) showed conclusive evidence of the presence of rabies. Most, if not all, of these examinations were made between November 2, 1909, and November 11, 1910, in three laboratories, the City Laboratory of Los Angeles, the Pathological laboratory of Dr. Stanley P. Black in Los Angeles, and the State Hygienic Laboratory in Berkeley. During this same period two human deaths occurred in California from hydrophobia, and the United States Public Health and Marine-Hospital service in Washington, D. C., sent virus for 92 Pasteur treatments to this state. The procuring of virus from Washington, or sending the person bitten to some Pasteur institute in the central part of the United States necessitates a delay which sooner or later will be responsible for deaths. A Pasteur institute is needed on this coast, and it seems wise that it should be under state control as a Department of the Hygienic Laboratory rather than that one or more institutes on a commercial basis should be allowed to take possession of the field.

The third great function of the Hygienic Laboratory is investigation. This is directed along a great many widely separated lines.

The supplementing of the field work of the Sanitary Expert of the State Board of Health by the analysis of water samples and of sewage, and by

the study in the laboratory of problems concerning the methods of water or sewage purification, should be an important work of the laboratory. The bacteriological part of these investigations, especially the examination of drinking water for the presence of colon bacilli indicating sewage contamination, is at present being done and will continue to be of great importance in the control of water supplies. There should be a separate department or laboratory for the study of sewage and water problems, and this laboratory would probably find it necessary to maintain experiment stations for the study of the purification of sewage and water under the special conditions existing in our state. This department should be in charge of a man who has had the training of a civil engineer, and who has specialized in sanitary engineering. The chemical examinations of water and other substances for the detection of ingredients dangerous to public health could well be combined with the examination of food and drugs in a department headed by a man whose training has been that of a chemist. A laboratory of this sort is now separately maintained by the state for the examination of food and drugs.

Investigations of the sterilizing power of antiseptics and disinfectants should be made by the bacteriological branch of the laboratory. Whenever a new and valuable product is not properly appreciated by the public, and especially when some useless substance through misleading advertising is receiving undeserved popularity and is causing a false and dangerous sense of security in those who use it, the laboratory should investigate and publish the results.

Some of the eastern laboratories, for example the Research Laboratory of the Department of Health of the City of New York, are doing valuable work along various problems connected directly or indirectly with public health diseases. That research should be carried on along lines bearing on the welfare of the various sections of the state cannot be questioned. There are many broad problems important to the health of Californians which have not been satisfactorily worked out anywhere, and which, in many cases where satisfactory work has been done, have not been applied to the conditions existing here. A good example of research carried on within the field in which the results are to be applied, is the excellent study of bubonic plague in California, and of the methods of its control, carried on by the laboratories of the Public Health and Marine Hospital Service in San Francisco. A number of diseases which have been studied in many parts of the United States, but so far without great success, exist also in California. For example, the sources of infection of acute poliomyelitis and its method of spread are still obscure. It is only right that our state should carry on investigations, the results of which will add to the mass of information from which great and useful discoveries will certainly be made.

The fourth and last division of the functions of a State Hygienic Laboratory, is instruction. The work of the laboratory should be announced in popular and brief form in the Monthly Bulletins of the State Board of Health, and in circulars of instruction and advice to the people of the state. In addition to these popular writings warning people of dangers and teaching them the methods of avoiding them, discoveries of importance to the country at large should be published in scientific journals, or should be presented before scientific bodies. This would enable the results of our efforts to be used by the workers along similar lines in other parts of the world. The congresses on tuberculosis, the conventions of large medical and public health organizations, and the public health demonstration cars and rooms, should be made more effective by exhibits specially prepared in the State Hygienic Laboratory for the purpose of popular instruction. At present a box containing a set of killed cultures illustrating the bacteriology of ordinary life, and indicating the danger from flies, dust, and soiled fingers, is being planned for loaning to teachers and public health lecturers for use in demonstration in their work of instruction. Such outfits could easily be made to contain a few sterile tubes of culture medium ready for the performance of illustrative experiments in the growth of bacteria from material collected at the place of instruction. Occasionally the laboratory sends out at the request of physicians, slides of diphtheria bacilli or of brain substance containing Negri bodies, for purposes of demonstration. This function can be increased until considerable assistance is being given to health officers and physicians who are helping to solve the problems of their communities by doing laboratory work along public health lines.

The many functions which I have indicated in this article involve, of course, expenditures far beyond the present income of the laboratory. It is the desire of the workers along these lines to see at some time in the near future, a special building erected for the housing of the hygienic laboratory. A structure containing distinct groups of rooms devoted to bacteriology, to the Pasteur Institute, to the food and drug and chemical laboratories, and to the department of sanitary engineering and its laboratory, would bring together the various branches of the work. Smaller rooms for workers in research could be grouped with the corresponding laboratories. The administrative rooms of the various departments should be the headquarters where field workers of the State Board of Health can come to write their reports, to confer with the technical libraries of the departments, and to be in touch with the laboratory workers. A close acquaintance between the laboratory and field workers, and the opportunity for discussion of their mutual problems, are important to the efficiency of both branches of the work.

In order to bring to a high state of efficiency the many lines of work indicated in this article, it is necessary that the laboratory should receive the loyal co-operation of the physicians and health officers of all parts of the state. The local men are by necessity the first to discover the need for laboratory work, and are usually the collectors of the materials to be examined in the laboratory or the givers of information leading to the assignment of a special field worker to duty in their neighborhood. Not only should the laboratory work in intimate relation with physicians, but there should also be close

co-operation with sanitary engineers and with trained veterinarians, as well as with all other public-spirited individuals who are directing their energy toward improving the public health.

THE MAKING OF A HEALTH OFFICER.*

WILLIAM COLBY RUCKER, M. D., P. A. SURGEON, A. S. P. H. and M. H. S.

Within the past two or three years it has become more and more apparent to those engaged in the solution of sanitary problems that despite the enactment of legislation looking to the prevention of disease, the enforcement of the sanitary code is wellnigh impossible without a coincident education of the general public in the rudiments of hygiene. Hence in those states which are blessed with an efficient, wide-awake public health organization, public lectures have been employed, traveling exhibits of various sorts have been prepared and an extensive propaganda of sanitary education has been launched. The great colleges have introduced into the curriculum compulsory courses in hygiene, lectures on the prevention of disease have become a regular part of the program at teachers' institutes, and in the high schools and grammar schools elementary hygiene is now taught.

Societies for the prevention of tuberculosis, the eradication of the venereal peril and the inculcation of the principles of right living have been organized, and have been preaching their doctrines through the press and from the rostrum. We live in a physical age and the wave of physical reform, the attention to the bodily machinery of the individual and the mass, is sweeping from one end of the land to the other. The demand for a Federal Department of Public Health has crystallized itself in the Owen Bill which is now before the Congress; the popular magazines are devoting more and more space to matters of general and personal hygiene: in fact the sanitary renaissance is upon us and the corner stone upon which this great fabric rests is education.

Gratifying as this is to those who believe that publicity is the handmaid of sanitary science, a careful study of the mechanism of health administration in the United States reveals a woeful lack of uniformity and in certain instances, deplorable evidences of inefficiency. In a detailed study of the statistics of typhoid fever in the United States the writer has had occasion to review all the recent available reports of the various state Boards of Health and has been deeply impressed with the high character of a few of the reports and the evidences of defective organization of the remainder. The registration states issue publications showing careful collection of statistics and perfect system of health administration, but many of the states publish annual reports which are of no value to the student of sanitary work and its results. Some issue no reports whatever and a few do not even collect the vital statistics. Frequently pages which could well be devoted to the publication of statistical studies or reports of sanitary endeavors are utilized in biographies of members of the issuing Board, and in place of pictures of something of sanitary importance we find photographs of the governor or the state delegation in Congress. On the whole, when published the mortality statistics are quite accurate, but morbidity statistics as a rule are valueless. This latter fault should not be charged to the state boards of health, but to the profession as a whole. Some states do not use the International Classification of the causes of death, a few still cling to the classification introduced by Dr. Farr in 1835, while one or two boards seem to have a nomenclature all their own.

It is evident from the foregoing that something is wrong and it is the purpose of this paper to try and point out what this is and how it may be rectified.

With the exception of a few states, appointment to the state board of health and to the position of secretary or state health agent is a matter of political preferment and while the people are more generally demanding a higher efficiency of the occupants of these important offices, there is as yet too little attempt to secure the best trained men for these positions, and frequently the attached salaries are insufficient to tempt men of large experience. The tenure of office is also insecure and a public health officer who is unfortunate enough to arouse the animosities of those of strong political affiliations is apt to be rewarded with his congè. What has been said of state health officials applies equally to municipal and county sanitary officers. In the latter case the salaries are even lower and the tenure of office more insecure. Granted a sufficient salary and permanency in office, could physicians of ample training and experience be secured to discharge these important duties? While the Association of American Medical Colleges requires thirty hours of lectures in hygiene, it is hardly conceivable that such meagre instruction is sufficient to equip one who is to be entrusted with enforcement of the sanitary code and the protection of the general public from preventable disease. The average health officer is sincere in the discharge of his duty as he sees it, but it is doubtful if the limited instruction received in college, especially if the health officer is a graduate of long standing, and the meagre opportunities for study of modern sanitary methods, are extensive enough to meet all the requirements.

A few of the great eastern universities offer post graduate courses leading to the diploma of Public Health, but these are a long way off. The University of California, the Leland Stanford, Jr., University and the Oakland College of Medicine all contemplate introducing such courses into their curricula at an early date, but even if all of the medical colleges should offer opportunities it will be several years before they are largely attended, and even if they were, it would take several years before a sufficient number of certified sanitarians could be produced.

While I cannot speak for the plan and scope of the work which it is proposed to follow at Stanford, I am told that California contemplates the collection under a single head of a number of courses now scattered through several departments of the college of natural sciences. The non-technical course in the sanitary engineering curriculum, the

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